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IS 10660 (1983): Rubber Hydraulic Hose with Textile Reinforcement [PCD 13: Rubber and Rubber Products]



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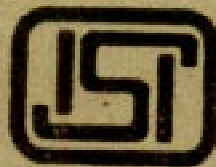
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IS : 10660 - 1983

Indian Standard
SPECIFICATION FOR
RUBBER HYDRAULIC HOSE WITH
TEXTILE REINFORCEMENT

UDC 621.643.3-987 : 678.4.029.5 : 677



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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

SPECIFICATION FOR RUBBER HYDRAULIC HOSE WITH TEXTILE REINFORCEMENT

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(*Continued on page 2*)

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(Continued from page 1)

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(Continued on page 10)

Indian Standard
SPECIFICATION FOR
RUBBER HYDRAULIC HOSE WITH
TEXTILE REINFORCEMENT

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 8 September 1983, after the draft finalized by the Rubber Products Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

0.2 This hose is intended for general applications in hydraulic systems on construction and industrial equipment and commercial products.

0.3 Types 1 and 2 hoses are designed for use with petroleum and water based hydraulic fluids within a temperature range of -40° to $+90^{\circ}\text{C}$. Operating temperatures in excess of $+90^{\circ}\text{C}$ may materially reduce the life of the hose. Type 3 hose is designed for use in low pressure and vacuum application with petroleum and water base hydraulic fluids within a temperature range of -40° to $+90^{\circ}\text{C}$.

0.4 Hydraulic hose has a finite life and factors which will reduce hose life are given below:

- a) Flexing the hose to less than the specified minimum bend radius;
- b) Twisting, pulling, kinking, crushing or abraiding the hose;
- c) Operating above or below the hose operating temperature range; and
- d) Exposing the hose to surge pressure above maximum operating pressure.

0.5 The committee felt the need to include a mandatory impulse test requirement in the standard. It could not be incorporated in this standard due to non-availability of sufficient data and experience. However, this test will be included as early as possible after a consensus of manufacturers and users is arrived at on the above test.

0.6 This standard contains clauses **4.3.3** and **4.5** which call for agreement between the purchaser and the supplier.

IS : 10660 - 1983

0.7 In the preparation of this standard considerable assistance has been derived from SAE 517 June 1983, Hydraulic hose, issued by the Society of Automotive Engineers.

0.8 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard prescribes the requirements, methods of sampling and test for high pressure hydraulic hose of rubber with braided textile reinforcement suitable for working temperature between -40° to $+90^{\circ}$ C.

2. TERMINOLOGY

2.1 For the purpose of this standard the definitions given in IS : 7503 (Part 1)-1974† and IS : 443-1975‡, shall apply.

3. TYPES

3.1 This standard covers the following three types of hoses:

- Type 1* Hose having a single textile braided reinforcement.
- Type 2* Hose having a double textile braided reinforcement.
- Type 3* Hose having spiral embedded wire helix and either woven textile or braided textile reinforcements. This hose is generally intended to be used as a suction hose.

4. REQUIREMENTS

4.1 Materials

4.1.1 Lining — The lining shall consist of a rubber compound resistant to hydraulic oils.

4.1.2 Reinforcement — The reinforcement shall consist of natural or synthetic fibre or combination thereof.

4.1.3 Cover — The cover shall consist of suitable weather and oil resistant rubber compound.

*Rules for rounding off numerical values (revised).

†Glossary of terms used in the rubber industry: Part 1.

‡Methods of sampling and test for rubber hoses (second revision).

4.2 Construction

4.2.1 Lining — The lining shall be seamless, reasonably uniform in thickness, concentric and free from air blisters, porosity splits and any other visible defects.

4.2.2 Reinforcement — For Types 1 and 2 hoses, the reinforcement shall consist of braided textile yarn only. The braided textile yarn shall be natural or synthetic fibre or combination thereof, firmly and evenly braided over the lining and braided plies impregnated with a suitable rubber compound.

For Type 3 hoses, the reinforcement shall be of woven, textile fabric or of braided textile yarn, natural or synthetic or combination thereof. In case of woven textile reinforcement it shall be well rubberized from both sides with a suitable rubber compound applied on bias at approximately 45° angle. The finishing end of the last ply shall overlap the start of the first ply at least by 6 mm. The braided textile reinforcement for Type 3 hose shall be laid in the same way as given above for Types 1 and 2 hoses.

4.2.3 Spiral Wire — For Type 3 hoses, suitable spiral wire shall be embedded in the body of the hose.

4.2.4 Cover — The cover shall consist of suitable rubber compound resistant to weather and oils. It shall be reasonably uniform in thickness, free from air blisters, porosity and splits. It may have a cloth marked finish and the whole shall be consolidated by wrapping uniformly and vulcanized to give good adhesion between the reinforcement plies and the rubber lining and cover of the hose.

4.3 Dimensions and Tolerances

4.3.1 The bore size and outside diameter when measured according to the method prescribed in 4 of IS : 443-1975*, shall be as given in Table 1.

4.3.2 The wall thickness of Types 1 and 2 hoses at different points when measured according to the method prescribed in 4.2.2 of IS : 443-1975*, shall not vary more than the following values. This test is not applicable for Type 3 hoses:

<i>Nominal Bore Size</i>	<i>Variation</i>
mm	mm
Up to and including 6.3	0.8
Over 6.3 but up to and including 22	1.0
Over 22 but up to and including 31.5	1.30

*Methods of sampling and test for rubber hoses (*second revision*).

TABLE 1 BORE SIZE AND OUTSIDE DIAMETER FOR TYPE 1, TYPE 2 AND TYPE 3

(Clause 4.3.1)

Sl No.	TYPE	NOMINAL BORE SIZE	PERMITTED RANGE OF BORE DIAMETER		PERMITTED RANGE OF OUTSIDE DIAMETER	
			Minimum	Maximum	Minimum	Maximum
(1)	(2)	(3)	(4)	(5)	(6)	(7)
		mm	mm	mm	mm	mm
	<i>Type 1</i>					
	i)	5	4.5	5.4	10.3	11.9
	ii)	6.3	6.1	7.0	11.9	13.5
	iii)	8.0	7.6	8.5	13.5	15.1
	iv)	10.0	9.2	10.1	15.1	16.7
	v)	12.5	12.5	13.5	19.0	20.6
	vi)	16.0	15.6	16.7	22.2	23.8
	<i>Type 2</i>					
	i)	5.0	4.5	5.4	11.9	13.5
	ii)	6.3	6.1	7.0	13.5	15.1
	iii)	8.0	7.6	8.5	16.7	18.3
	iv)	10.0	9.2	10.1	18.3	19.8
	v)	12.5	12.4	13.5	23.0	24.6
	vi)	16.0	15.6	16.7	26.2	27.8
	vii)	19.0	18.7	19.8	31.0	32.50
	viii)	25.0	25.0	26.2	36.9	39.3
	ix)	31.5	31.4	32.9	42.9	46.0
	<i>Type 3</i>					
	i)	19.0	18.3	19.8	—	34.9
	ii)	25.0	24.6	26.2	—	41.3
	iii)	31.5	30.6	33.0	—	50.8
	iv)	38.0	36.9	39.3	—	57.2
	v)	51.0	49.2	52.4	—	69.9
	vi)	63.5	61.9	65.1	—	82.6
	vii)	76.0	74.6	77.8	—	95.3

4.3.3 Length

4.3.3.1 The length of the hose shall be 15 metres or as agreed to between the purchaser and the supplier. Tolerance on hose length shall be ± 1 percent.

4.4 Physical Tests on Finished Hose

4.4.1 Tensile Strength and Elongation at Break of the Lining and the Cover — The tensile strength and elongation at break of the rubber used for lining and cover of the hose when tested according to the method prescribed in 5 of IS : 443-1975*, shall be as specified in Table 2.

TABLE 2 TENSILE STRENGTH AND ELONGATION AT BREAK OF LINING AND COVER

CHARACTERISTIC	REQUIREMENT	
	Lining	Cover
Tensile strength, MN/m ² *, <i>Min</i>	10.0	7.0
Elongation at break, percent, <i>Min</i>	200	300

*1 MN/m² = 10.2 kgf/cm² approximately.

4.4.2 Accelerated Ageing Test — After ageing at 100° ± 1°C for 72 hours in accordance with the method prescribed in IS : 3400 (Part 4)-1978† the rubber used for the lining and cover of the hose shall not vary by more than ± 25 percent in tensile strength and \pm_{45}^{+10} percent for elongation at break of the corresponding values obtained before ageing when tested according to the method prescribed in 5 of IS : 443-1975*.

4.4.3 Swelling Test — When representative samples of rubber lining and cover of the hose are subjected to swelling test at 100° ± 1°C for 72 hours in Oil No. 3 specified in Appendix A, IS : 3400 (Part 6)-1967‡, the volume shall not increase by more than 100 percent when tested according to the method prescribed in IS : 3400 (Part 6)-1967‡.

4.4.4 Hydrostatic Pressure Test

4.4.4.1 The hose when tested according to the method prescribed in 8 of IS : 443-1975*, shall comply with requirements of the test.

4.4.4.2 Pressure ratings — The working pressure of the hose shall comply with the requirements of Table 3.

4.4.4.3 Proof pressure test — The hose when tested according to the method prescribed in 8.3 of IS : 443-1975*, shall withstand, without damage, proof pressure as given in Table 3.

4.4.4.4 Change in length at designed working pressure — Change in length at designed working pressure when tested according to the method prescribed in 8.4 of IS : 443-1975*, shall be within $\pm \frac{2}{4}$ percent.

*Methods of sampling and test for rubber hoses (*second revision*).

†Methods of test for vulcanized rubbers: Part 4 Accelerated ageing (*first revision*).

‡Methods of test for vulcanized rubbers: Part 6 Resistance to liquids.

4.4.4.5 The hoses shall be capable of being bent to the radii given in Table 3 at their respective design working pressures.

4.4.4.6 Bursting pressure test — A 45 cm length hose shall be subjected to hydrostatic burst test in accordance with **8.2** of IS : 443-1975*. The bursting pressure shall be not less than that specified in Table 3.

4.5 Optional Requirements

4.5.1 Ozone Resistance Test — If agreed to between the purchaser and the supplier, the hose may be subjected to ozone resistance test as prescribed in IS : 3400 (Part 20)-1977†. For this test the piece shall be exposed for 70 hours in an atmosphere composed of 50 parts ozone per 100 million parts of air at an ambient temperature of 38°C. The specimen shall not show evidence of cracking or deterioration when viewed with $\times 7$ magnification while still in stressed condition.

5. MARKING AND PACKING

5.1 Marking — Each length of the hose shall be indelibly marked at least, once every 3 m with the following information:

- a) Manufacturers' name or recognized trade-mark, if any and the hose nominal bore;
- b) Month and year of manufacture; and
- c) Type of hose.

5.1.1 Each length of the hose may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

5.2 Packing — The hose shall be packed as agreed to between the purchaser and the supplier.

6. SAMPLING AND CRITERIA FOR CONFORMITY

6.1 For the purpose of ascertaining the conformity of the hoses in a consignment, to the specification, the scale of sampling and the criteria for conformity shall be as prescribed in **3** of IS : 443-1975*.

*Methods of sampling and test for rubber hoses (*second revision*).

†Methods of test for vulcanized rubbers: Part 20 Resistance to ozone.

TABLE 3 DESIGN WORKING PRESSURE, PROOF PRESSURE, BURST PRESSURE AND MINIMUM BEND RADIUS*(Clauses 4.4.4.2, 4.4.4.3 and 4.4.4.6)*

SL NO.	TYPE	NOMINAL BORE SIZE	WORKING PRESSURE	PROOF PRESSURE	BURST PRESSURE	BEND RADIUS (MINIMUM)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
		mm	MN/m ²	MN/m ²	MN/m ²	mm
<i>Type 1</i>						
i)		5	3.4	6.8	13.6	51
ii)		6.3	2.8	5.5	11.0	64
iii)		8	2.8	5.5	11.0	76
iv)		10	2.8	5.5	11.0	76
v)		12.5	2.8	5.5	11.0	102
vi)		16	2.4	4.8	9.7	127
<i>Type 2</i>						
i)		5	10.3	20.7	41.4	76
ii)		6.3	8.6	17.2	34.5	76
iii)		8	8.3	16.5	33.1	102
iv)		10	7.8	15.5	31.0	102
v)		12.5	6.9	13.7	27.6	127
vi)		16	6.0	12.1	24.1	140
vii)		19	5.2	10.3	20.7	152
viii)		25	3.9	7.8	15.5	203
ix)		31.5	2.6	5.2	10.3	254
<i>Type 3</i>						
i)		19	2.1	4.1	8.3	127
ii)		25	1.7	3.4	6.9	152
iii)		31.5	1.4	2.8	5.5	203
iv)		38	1.0	2.1	4.1	254
v)		51	0.7	1.4	2.8	305
vi)		63.5	0.4	0.9	1.7	356
vii)		76	0.4	0.8	1.5	457

NOTE — 1 MN/m² = 10.2 kgf/cm² approximately.**7. TESTS**

7.1 Unless otherwise agreed to between the purchaser and the supplier all tests shall be carried out within three months of the date of receipt of material by the purchaser.

IS : 10660 - 1983

(Continued from page 2)

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